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Home-made Dairy Products

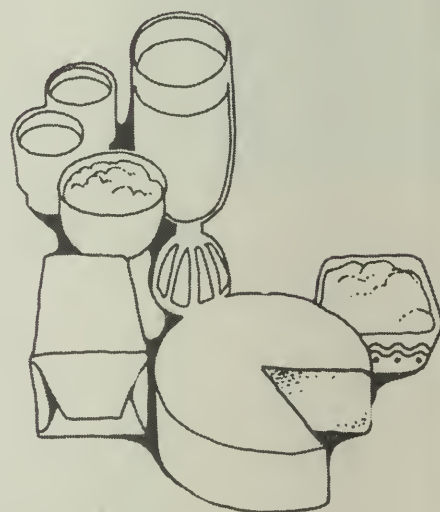
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Home-made Dairy Products

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Our grandparents made their own butter, cheese and other dairy products. This custom almost died out when large commercial dairies began to distribute a wide range of high-quality products to the consumer.

In the past few years, many people have again become interested in home-made dairy products. This publication tells how you can make some of these.

Read this book, and study other available literature. If possible, get advice from knowledgeable persons. Then try to make dairy products yourself. You may make mistakes (trial and error is a great way to learn), but don't give up if your first attempts don't work. Find out what went wrong, and try again. Your reward will be delicious.

EQUIPMENT AND SUPPLIES

You can make many dairy products using regular kitchen utensils. Other items, such as wooden paddles for making butter and curd cutters for making cheese, are tools you can design yourself. Circular ice cream and margarine containers, with the bottoms cut out, make good cheese hoops. Use your ingenuity. You may get some useful ideas if you visit a pioneer village or a museum.

Rural hardware stores sometimes sell butter churns, and you can find yogurt makers in many department stores. Cheese-making kits, small milk pasteurizers and dairy thermometers are also sold commercially.

Buy a *good* thermometer. A dairy thermometer is best, as it floats in milk and water.

Look in health food stores for rennet, starter cultures and other supplies. You may also be able to buy starter from companies who sell it to the dairy industry.

Read the instructions for each product you intend to make and be sure you have all the equipment and supplies needed before starting.

Sanitation is important. To prevent bacterial contamination of equipment and containers, wash them thoroughly before each use. Use boiling water or a mild solution of household bleach (10 mL/L) as a final rinse. Boil all wooden equipment. Do not let pasteurized milk or the final product contact unsanitized equipment. The storage area must be clean and dry; if mold or mildew occur, wash shelves and walls thoroughly with a solution of household bleach (25 mL/L) and ventilate the area sufficiently to dry it out.

MILK AND CREAM

You need a supply of milk and/or cream. If you are a farmer, you may have a cow of your own, or a neighbor may have a surplus of milk. If you live in a town or city, you might arrange to buy milk from a nearby farm.

The milk produced by today's farmers is different from the milk our grandparents knew. Modern farms use very efficient refrigerated tanks. Sanitizers eliminate almost all the bacteria from the equipment and the normal milk-souring bacteria have all but disappeared. In their place we have cold-tolerant (psychrotrophic) bacteria that seldom cause milk to sour. Instead, they cause putrid and bitter flavors, and sometimes a sweet curdling spoilage. For this reason, many traditional methods used to make dairy products at home no longer work satisfactorily. The methods outlined in this publication are designed to overcome this problem.

Milk and cream from the supermarket create problems for some products. Homogenized milk will not coagulate to a firm curd for cheesemaking; homogenized cream will not separate and will not churn properly. Pasteurized milk and cream become contaminated with putrefactive bacteria that eventually cause off flavors to develop.

You can use powdered milk to make some products but this does not work as well as fresh milk, because of the high-heat treatment it has received. For example, it does not make good cheese. However, if you use it properly, powder can be a useful and inexpensive extender or replacer for regular milk in products like yogurt and buttermilk.

Goats' milk is different from cows' milk. If you wish to use it, get a booklet that tells you how.

Pasteurizing

Be sure to pasteurize raw milk before you use it. This kills microorganisms that cause tuberculosis, typhoid, undulant fever and other diseases. In Canada, all milk and cream offered for sale must be pasteurized, by law.

Pasteurization is doubly important if you make fermented products, as it destroys organisms which could compete with the starter culture. It also causes physicochemical changes in the milk proteins that help give "body".

To pasteurize milk and cream, use a double boiler. Heat milk to be used for cheese and for drinking to at least 63°C, and hold it at that temperature for 30 minutes (82°C and 30 minutes for milk and cream to be used for other products). Stir frequently to prevent burning. A skin will form on the surface of the milk; skim this off as it causes lumpiness in fermented products.

If you use homogenized milk for the products that allow this, always repasteurize it at the 82°C temperature; this gives more body and texture and destroys interfering bacteria.

After heating, cool the milk or cream quickly in cold water and refrigerate it immediately to 5°C or below. Never mix warm milk or cream with that already in storage—cool it first. Take care not to contaminate it with raw-milk utensils, hands, or anything else.

You can use low direct heat to pasteurize milk in a pan, but you have to stir constantly; the double boiler is better. If you intend to make larger quantities of dairy products, small electric pasteurizers are available.

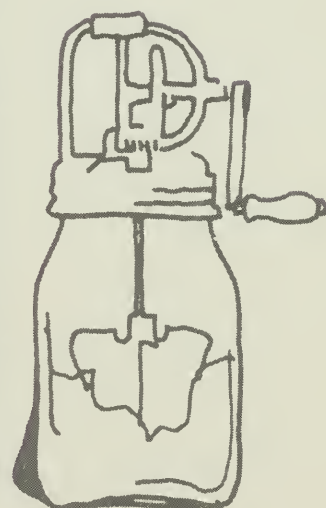
MAKING BUTTER

Butter is formed when cream is agitated, causing small globules of butterfat to stick together. The best container for small quantities is probably a 4.5 L glass churn with wooden paddles.

Use cream that is pasteurized, but not homogenized. Pasteurization destroys microorganisms and enzymes and gives butter that lasts much longer in storage. You can use cream pasteurized earlier and refrigerated up to a week, but be sure it has a fresh, clean taste before you churn it.

Half fill the churn (2.25 L) and stir vigorously until the butter forms—about 30 to 40 minutes. Every few minutes, loosen the top to let gases escape. For best results, start with cream at 13 to 16°C (higher in winter, lower in summer); colder cream churns more slowly. High temperatures cause fat losses and produces butter of poor texture.

When the globules are about the size of corn kernels, empty the churn and let the buttermilk separate from the butter. Wash the butter with cool water, work out all the droplets with a wooden paddle and drain it off. Then, add salt (15 g/0.5 kg of finished product) and thoroughly blend it into the butter with the wooden paddle. You can use more or less salt, to suit your taste, but remember that less salt means poorer keeping quality.





Put the butter in closable containers, or mold it into rolls or blocks, and wrap in wax paper. Store the butter in the refrigerator or freezer where it will keep for several weeks.

If you don't have a churn, you can simply shake the cream in a clean glass jar, loosening the top every few minutes to release gas pressure.

Originally, people just allowed cream to sour in a cool place before churning. We don't recommend this, as such cream may undergo undesirable fermentation and develop off flavors. However, you can use pasteurized cream, cultured as outlined in the section on sour cream, and make delicious butter. Cultured butter does not keep as well as sweet-cream butter.

CULTURED MILK PRODUCTS

Cultured milk products contain lactic acid and other compounds that give flavor, and are very popular today. Yogurt, sour cream, most cheeses and some other products are produced this way.

The culturing process is a controlled souring of milk by bacteria. Natural souring, as practiced before World War II, is no longer practical, as the bacteria now found in milk cause putrefaction rather than souring. Today we can make fermented products only by adding "starter cultures"; bacterial cultures that cause lactic acid to form in the milk.

Starter Cultures

Starters can be purchased as noted in the section on "Equipment and Supplies", or you can use fresh commercial buttermilk or sour cream as starter for all products except yogurt. If you use the buttermilk or sour cream, you'll have to buy a fresh supply for each batch if you make batches less often than every 4 or 5 days, as the bacteria die rather quickly.

Starter can be grown in milk or in reconstituted skim milk powder. Either mix the powder in the ratio of 100 g powder to 900 mL water, or as the package directs for making reconstituted milk. Heat the milk to 82°C and hold it at that temperature for 30 minutes, then cool it to 22°C and add 10 to 20 mL starter per litre. The culture should coagulate in 14 to 16 hours into a firm, smooth substance, free from whey and gas bubbles. Try to maintain the 22°C temperature to get a consistent bacterial growth.

If your starter does not work out, look up the problem in the following chart and try again.

Starter Defect	Possible Cause	Solution
Doesn't coagulate	Poor culture Contaminating organisms Inhibitory substances in the milk	Get new culture Check pasteurization and sanitation Get new milk supply
Gas bubbles in the body	Contaminating bacteria	Check pasteurization and sanitation
Lumpy or grainy curd	Ripening temperature too high Ripening period too long Acid content too high	Check time and temperature of incubation
Wheying off (free whey, a clear watery liquid, on the surface)	Acid content too high Starter agitated before acidity fully developed Starter disturbed during incubation	Check time and temperature of incubation Chill quickly Avoid excessive agitation
Bitter-harsh flavor	Contaminating bacteria Overripening	Check pasteurization and sanitation Check time and temperature of incubation Get new starter
Fruity unclean flavor	Contaminating organisms	Check pasteurization and sanitation
Flat flavor	Flavor-producing organisms absent Incubation temperature too high	Get new starter culture Check temperature of incubation

Cheese

There are many types of cheese—subtle differences in making procedure and composition determine the type. Flavor depends on the source and quality of the milk used, freedom from contaminants, the amount of moisture retained in the curd, the amount of salt added, the method of salting, the temperature and condition of ripening, and the amount and quality of starter and rennet used. The temperature at which the cheese is stored and the duration of storage determine whether the product will be mild, medium or sharp flavored.

You will need a dairy thermometer, rennet tablets, curd cutter (or a thin sharp knife), perforated molds, wire draining rack, and milk-setting pans. If you wish, you can buy one of the home cheese-making kits that are on the market; these are an excellent way to learn how to make cheese.

You can make about 100 g of cheese from 1 L of milk. The methods which follow work from this quantity; multiply all amounts by the same factor if you wish to make larger quantities.

CHEDDAR-TYPE Heat 1 L of pasteurized whole milk to 30°C and add 20 to 30 mL of an actively growing starter culture. Hold the temperature for 30 to 40 minutes and then add enough rennet (use the quantity in the directions) to coagulate the milk (shows the first signs of clotting) in 10 to 15 minutes. When the curd is well set (about ½ hour), cut it into 6 mm cubes with a wire curd cutter or thin-bladed knife, and stir the cubes gently while heating to 39°C. The whey will now begin to separate from the curd. Hold at that temperature for 1½ to 2 hours, stirring gently and frequently.

Stir 10 to 15 minutes to completely drain the whey from the curd. Then allow the curds to stick together for several hours in a warm place, frequently turning them over and over to induce matting and the formation of a smooth, continuous mass. This process is called cheddaring.

You should be able to taste a slight acidity in the whey or in the curd, especially during the last stages of cheddaring. Sometimes acid does not develop, because of inactive starter or antibiotics in the milk. If this happens, don't eat the cheese. Throw it out and try again.

After cheddaring, cut the cheese into 15 mm strips, and thoroughly blend in 2 g salt, using a wooden or stainless steel spoon or paddle. Then place the cheese in a hoop or mold (a straight-sided cylinder, open at both ends), under pressure, for about 24 hours, to form the cheese block.

Blocks should be stored for at least 2 weeks at a temperature of 14°C or less. If mold appears on the surface during this curing period, wipe the cheese with a clean cloth moistened with vinegar. After drying the surface, you can wax the dried block with paraffin to prevent dessication and moldiness. The waxed cheddar will keep several months, and possibly a year, when stored at 5°C or less.

SEMI-SOFT CHEESE Stir 1 L of fresh, pasteurized whole milk to thoroughly mix the cream, then heat to 27°C. Add 20 to 30 mL of an actively growing starter culture, and half the amount of rennet used for cheddar to cause the milk to coagulate firmly in about an hour. Be careful not to use too much or too little rennet, or the cheese will be dry, hard and bitter, and the curd will not set properly.

When the curd is well set, cut it into cubes 15 mm square with a wire curd cutter or thin-bladed knife. Stir the cubes gently for about 5 minutes, being careful not to break the curd. If you wish, you can heat it gently at this stage (36°C) to get a drier, firmer cheese that ripens more slowly but stores longer.

Place the mold on a wire screen over a pan. Pour off the surplus whey, and place the curd into the mold (the remaining whey will drain through the screen and into the pan). Turn the mold over every few hours, until 24 hours have elapsed. You can now easily remove the curd from the mold, as it will have shrunk, and place it on a clean, white, cotton cloth set over a wire rack. Shake a heavy coat of salt on the top and sides of the cheese and leave it until the next day, then turn it over and salt the bottom as well.

Let the cheese cure for about 2 weeks in a cool place of even temperature and humidity. During this time, occasionally wipe the cheese with a clean cloth dampened with vinegar, to prevent mold. When the surface is dry, dip the cheese in paraffin to prevent mold and dessication, and let it cure another 2 weeks.

Curing can be done in a month, but a longer period greatly increases the flavor of the product. When carefully made, this cheese is mild and rich, and has a pleasant flavor.

COTTAGE CHEESE Add 3 to 10 mL of starter to 1 L of pasteurized skim milk at 20-22°C; the milk should coagulate in 14 to 16 hours. Alternatively, you can add 50 mL of starter to milk at 30-32°C, and have it coagulate in 4 to 6 hours. Maintain temperatures during coagulation.

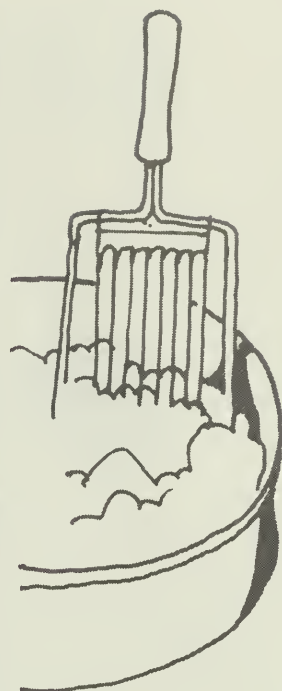
When the milk has coagulated enough for a line of whey to be seen in a knife cut, cut the curd into 15 mm strips with a thin-bladed knife or into 15 mm cubes with a wire curd cutter. Let the whey drain for about 15 minutes, then raise the temperature slowly to 55°C over a 2-hour period, stirring slowly and only enough to keep the curds from matting. If you have cut the curds into strips, they will now break up and approximate cubes.

The curds should now have a soft, slightly elastic texture when pressed between the fingers; if still soft and mushy, drain part of the whey and replace it with hot water (55°C) which will help firm the curd. When the curd is firm, drain the whey from the pot.

If you want a highly flavored old-style cottage cheese, cool it quickly without washing. If you'd prefer a milder flavor, soak the curd in a litre of cold water for 20 minutes, then change the water and repeat a second, and even a third, time. After the final soak, drain it through cheesecloth. Add cream and salt to taste, and refrigerate immediately in small containers.

You can use whole milk to make cottage cheese, as long as it isn't homogenized (you won't have to add cream), but don't try skim milk powder.

If you encounter problems in making cottage cheese, check the following chart.



Problem	Possible cause	Solution
Soft curd	Too high a temperature during pasteurization	Do not exceed 63°C during pasteurization
	Too high an acid content	Cut curd few minutes after coagulation and begin cooking almost immediately

As mentioned earlier, replacing hot whey with hot water at the end of cooking will overcome some of the problem of soft curd. But it is better to do everything right and not have to try this.

CREAM CHEESE You can make a pleasant tasting spread from light cream. Add to 1 L of pasteurized cream at 22°C, with stirring, 20 mL of fresh cultured buttermilk, sour cream, or cheese starter. Incubate at 22°C until a firm coagulum has formed, usually 14 to 16 hours. Break the curd with gentle stirring and pour it into a muslin bag. Suspend the bag over a bowl which will collect the whey, in the refrigerator. When the draining whey slows to a slight drip, stir the curd and hang it in the bag again. Leave it overnight to finish draining, then put it in a container and store in the refrigerator. Use the cream cheese within a few days before off flavors develop.

NORWEGIAN WHEY CHEESE Scandinavians use the whey from regular cheesemaking to make a very hard, sweet yet slightly sour product. They eat it, thinly sliced, on bread and biscuits.

Boil the whey with constant stirring until it reaches the consistency of peanut butter. Then cool it slightly, continuing to stir, until the milk sugar starts to crystallize, much as maple sugar does. Press it into a greased pan or mold, and cool it.

If you find the whey cheese too hard, you can make the next batch softer by adding butter or cream at the end of the boiling process. The cheese will keep for several weeks even without refrigeration.

Buttermilk

Buttermilk is the by-product when you churn sour cream to make butter. Because modern cream gives bitter flavors as it sours, we now make our buttermilk with cultures.

Use 1 L of fresh, pasteurized skim milk. If you wish, you can fortify it with skim milk powder (10 to 15 g) or use reconstituted skim milk powder (110 g/900 mL water) by itself. Keep the solids content at 9.5 to 11% (fresh skim milk has about 8.5%). A little salt improves the flavor.

After pasteurization, cool the milk quickly to 22°C, and add 2 to 10 mL starter. Leave it undisturbed in a tightly covered container for 12 to 16 hours, until it develops a firm body. Be careful not to shake or vibrate the container; wheying-off might result.



Now cool it quickly to under 10°C, with *gentle* agitation. A bit of whey might form at the surface, but is not harmful; you can stir it in just before serving.

If you have problems, refer to the following chart.

Problem	Possible cause	Solution
Flat flavor	Low solids	Add skim milk powder
	Insufficient acid	Increase incubation time, check temperature
	Excessive agitation	Avoid agitation
Undersirable flavor	Poor starter	Get new starter
	Contaminating bacteria	Check pasteurization and sanitation
		Get new starter
Sharp biting flavor	Excess acid	Check time and temperature of incubation, perhaps reduce time
Too thick	Excess acid	Check time and temperature of incubation, perhaps reduce time
Too thin	High solids	Use less skim milk powder
	Low pasteurization temperature	Check pasteurization procedure
	Low acidity	Check time and temperature of incubation
		Increase amount of starter
	Low solids	Add skim milk powder



Sour Cream

Sour cream is made by adding a starter culture and ripening light cream, resulting in an acid, smooth, heavy gel.

Use only good-quality pasteurized cream that tests at 18% fat content. As opposed to the other products in this publication, it is *best* to use homogenized cream, as this gives a smoother, thicker gel with less wheying-off.

Inoculate 1 L of cream, at 22°C, with 20 mL of an active starter culture, right in the container you intend to store it in. It should ripen to the desired acidity in 14 to 16 hours. Then cool it as quickly as you can to 4°C, disturbing it as little as possible.

Refrigerated, a good sour cream keeps up to 3 weeks.

Yogurt

Yogurt has become very popular in Canada over the past few years. You can make it as a set-custard type, or as a stirred type. If you prefer, you can add flavor or fruit .

Small home yogurt makers can be bought in department and hardware stores, and are very easy to use. Some have thermostats which maintain the proper temperature during incubation.

Starter cultures for yogurt are not the same as those for other products. Commercial cultures are available, but it is more practical to buy and use a fresh package of plain yogurt from the supermarket. Different brands have different characteristics, so try several until you find one that suits you.

STIRRED TYPE Use 1 L of pasteurized whole milk, partly skimmed milk (1 or 2%) or skimmilk. You can use homogenized milk. If you wish, add 40 mL condensed milk or 10 g (heaping teaspoon) skimmilk powder to give a thicker body. Heat the milk to 82° C for 30 minutes and cool to 45° C, then inoculate by adding 30 mL of plain yogurt. If you intend to flavor the yogurt, you can add the flavor essence or syrup (not solid fruit) at this point. Pour the milk into the containers in which the yogurt will be stored and hold at 42 to 45° C for 2½ to 3 hours, or until coagulated. Then refrigerate immediately at 5 to 7° C. When cool, stir the yogurt into a smooth paste, using a clean spoon. It will keep for 2 to 3 weeks.

SET TYPE Use the same milk and procedure as for stirred type, except do not stir. Another method is to stir 1.5 tablespoons Swiss-style plain yogurt into the milk and mix well. Pour into warm sterilized jars, filling to within 2.5 cm from top. Cover with plastic wrap, then lids. Place jars in pan of lukewarm water (43° C); the water should be level with the yogurt in the jars. Cover the pan and put it in a warm place to maintain the water temperature; the center of the top of a 70 cm stove with the oven set at 107° C is a suitable place. Allow to stand, without disturbing, until set (2 to 4 hours), then refrigerate overnight before use. It will keep in the refrigerator for about 2 weeks.

NOTE In both methods, you can use homemade yogurt as a starter, for succeeding batches. The homemade yogurt should be no more than 4 days old, and each month you should begin with a fresh culture.

FLAVORED YOGURT You can flavor yogurt with jams, jellies, syrups and solid fruits. Solid fruits may be canned, fresh or frozen (if first thawed).

For stirred-type yogurt, you can add flavor at time of inoculation (not solid fruit at this time). Or, you may add solid fruits and/or flavors later when you stir the yogurt. In the last case, refrigerate 2 hours before eating to blend the flavors.

With set-type, place the flavor or fruit on the bottoms of the containers and then carefully layer the inoculated milk over it. The finished product must not be agitated during and after coagulation. Alternatively, you can add flavor or fruit to the top before eating, like a sundae.

DEFECTS OF YOGURT If your first attempt doesn't turn out well, refer to the following table.

Defect	Possible cause	Solution
Absence of typical yogurt flavor and aroma	Too low an acid development Poor starter	Increase amount of starter Check time and temperature of incubation Get new starter
Unclean and/or bitter flavor	Poor-quality milk Contaminated starter	Check pasteurization and sanitation Get new starter
Slow acid production	Insufficient starter Old starter	Increase amount of starter Check time and temperature of incubation Get new starter
Weak curd formation	Low milk-solids content Poor starter	Add milk powder or condensed milk Get new starter

Acidophilus milk

Acidophilus milk is a fermented milk with a strong acid flavor. The special culture organisms used die rather quickly, so you will need a fresh culture for each batch unless you make it daily.

Use 1 L of whole milk (homogenized, if you wish), partly skimmed milk or skimmilk. Use extreme pasteurization—90°C for up to 1½ hours—to give the product more body and to kill interfering bacteria. Add 50 mL active culture and incubate at 37 to 38°C for 18 to 24 hours, until it has a strong acid flavor. Then refrigerate until used. It will only keep a few days.

Kéfir

Kéfir is an eastern European drink which is slightly alcoholic and usually effervescent (carbonated). The culture grows in lumps called Kéfir grains. They are white to cream colored when growing, but tan to brown in color when dry.

Soak 30 g Kéfir grains in lukewarm water for about 6 hours, then add them to 1 L of pasteurized milk at 22°C. You can use whole milk (homogenized, if you wish), skimmilk or reconstituted skimmilk powder. Incubate at 22°C until a curd has formed, then strain through a sieve to recover the grains. Chill the milk, and it is ready to drink.

If you incubate the milk in a tightly closed container, carbon dioxide produced by the process will make it effervescent.

The grains which you recovered by straining can be used again; just wash and dry them, or refrigerate in sterile water if you intend to use them again within a few days.

CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm ²)	x 0.15	square inch
square metre (m ²)	x 1.2	square yard
square kilometre (km ²)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm ³)	x 0.06	cubic inch
cubic metre (m ³)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2.5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre

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